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STAFF APPRAISAL REPORT

KOREA

SECTOR PROGRAM ON

HIGHER TECHNICAL EDUCATION

January 11, 1980

Regional Projects Department
East Asia and Pacific Regional Office

CURRENCY EQUIVALENT

Won 485 = US$1.00
Won 100 = US$0.2062

GLOSSARY

CEB	-	College Education Bureau
EFB	-	Educational Facilities Bureau
EPB	-	Economic Planning Board
IEB	-	Industrial Education Bureau
KMEB	-	Korea Management Education Board
MOE	-	Ministry of Education
MOST	-	Ministry of Science and Technology
OSROK	-	Office of Supply, Republic of Korea
SNU	-	Seoul National University
TERI	-	Technician Education Research Institute

GOVERNMENT OF KOREA FISCAL YEAR

January 1 - December 31

KOREA: APPRAISAL OF A SECTOR PROGRAM ON HIGHER TECHNICAL EDUCATION

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KOREA

HIGHER TECHNICAL EDUCATION

BASIC DATA (1978)

Higher Education

Enrollments (grades 13-19 equivalent)	407,000
% female	24
Gross enrollment ratio/a	18%
Female enrollment ratio	9%

Higher Technical Education

Enrollments in technical fields at tertiary level	132,000
As a percentage of total enrollments at tertiary level	32%

	Total	Of which technical
Distribution of enrollments in higher education		
Postgraduate courses (grades 17-19)	19,000	5,500 (29%)
Universities and colleges (grades 13-16)	278,000	73,000 (26%)/b
Junior colleges (grades 13-14)	110,000	53,500 (48%)

Engineering students by field of study:

	University Level /c	Technician Level
Civil engineering group	8,170 (22% of total)	8,640 (16% of total)
Electrical engineering group	9,310 (25%)	16,720 (31%)
Mechanical engineering group	11,700 (31%)	16,160 (30%)
Chemical engineering group	4,640 (13%)	4,960 (10%)
Others	3,330 (9%)	6,880 (13%)

Percentage of enrollment in:		
-evening classes	16	22
-Seoul	48	13
-private schools	72	86
Student/Teacher Ratios:		
Engineering & technician education	41:1	29:1
Management education	69:1	-

Equity indicator (Gini coefficient)/d	- 0.38
Applicant/admissions ratio	- 4:1
Scholarship coverage in higher education	- 6% of enrollment
Fee exemption coverage in higher education	- 16% of enrollment

Financial Data

Public expenditure on education as percentage of GNP	2.8%		
Public expenditure devoted to education	17.5%		
Public education expenditure on higher education	6.6%		
		Public	Private
		(%)	
Total Expenditure (public and private) for higher education:	US$411 million	27	73
Of which: universities	US$324 million	29	71
Of which: junior colleges	US$ 87 million	19	81
Estimated total private expenditure for higher education	US$300 million		

Percentage of expenditure for development - For universities 20%
- For junior colleges 11%

Unit Recurrent Costs

Average for higher education	US$1,050
Average for engineering education	US$1,000 (estimate)
Average for technician education	US$ 800 (estimate)

Note: Enrollments include overage and underage students.

/a Including overage students.

/b Including 18,000 in management courses.

/c Excluding freshmen which is a common Year I.

/d The Gini coefficient measures the degree of inequality in the distribution of two variables, e.g. the total number of people in a particular age group and the number enrolled, with 0.0 representing absolute equality and 1.0, absolute inequality.

Sources: MOE Statistics; KEDI, "Long-Term Educational Development Prospect, 1978-91"; and mission estimates.

1. INTRODUCTION

1.01 The Korean economy has achieved remarkable success, particularly in the growth of export-oriented manufactures./1 Manufacturing (including mining) output has grown at an average annual rate of over 20% in real terms since 1960 and its share of GNP rose from 15% in 1960 to 30% in 1978. The export of manufactures accounts for some 90% of total commodity exports. Industrial expansion, stimulated by international demand, has been based on the growth of light industry, largely textiles, footwear, and simple, assembled electronic products; since 1960, light industry has grown at an average annual rate of 17% in real terms.

1.02 Korea's successful industrialization has been based largely on the exploitation of well-established, imported technologies and a ready supply of productive, inexpensive labor. The technologies used were often developed 25 years ago or earlier, and were relatively simple, requiring few sophisticated skills. Industry was thus able to expand without extensive research and development costs or a great need for high level technical manpower. Expansion depended instead on the availability of a generally well-trained labor force, whose workers commanded relatively low wages. By 1970, virtually 100% of the employed labor force was literate and nearly 90% of production workers had completed secondary and/or primary education. This broad base of education has allowed the work force to fulfill the skill demands of Korea's labor-intensive production methods.

1.03 Korea's education system has contributed to industrialization by emphasizing widespread provision of basic education (primary and general secondary) and vocational training at the secondary level. Universal enrollment of the primary school age group was achieved by 1970 and about 60% of the secondary school age group was enrolled by 1975. Priority was also attached over the last decade to expanding training capacity for industrial workers, i.e., at technical high schools and vocational training institutes. Between 1970 and 1978, secondary enrollments in vocational fields more than doubled (to 615,000) and accounted for 42% of total secondary enrollments. In addition, some 5,000 grade 9 school leavers (this figure is expected to double by 1981) attend one- to two-year skill training courses at vocational training institutes. As a result of these programs, the needed training capacity for skilled workers has largely been met.

1.04 The Bank Group has supported the industrialization process in the education sector by concentrating lending on training for skilled and semiskilled workers. Its four loans/credits amounted to US$103.3 million, roughly 50% of which was allocated for vocational (industrial) training at the secondary level, 30% for teacher training and university assistance, and 20% for other secondary and postsecondary education.

/1 In 1976 Korea ranked third highest among "middle income countries" in manufactured exports (World Development Report, 1979, Table 12).

Over 60% of the 25,000 student places created or improved under these projects fall under the category of vocational/technical training at the secondary level (see Project File).

1.05 Further industrial growth requires strengthened higher education in the technical fields. A subsector survey /1 of higher technical education in July 1977 concluded that future government and Bank assistance for education should continue to support the manufacturing sector, but with a major shift, consistent with the increasing complexity of Korean industry, toward higher technical skills in engineering, management and technician education. To follow through on this recommendation, four separate study teams (composed of Korean specialists assisted by part-time foreign experts) were formed in August 1978 to make comprehensive analyses and proposals in the fields of manpower supply/demand, engineering education, management education and technician training. The interim reports of the four study teams provided a basis for Bank preappraisal in November 1978. The final reports of the study teams were incorporated into a loan request /2 with an introductory summary by the MOE. These reports formed the basis for the Bank's appraisal, carried out by a mission that visited Korea in April 1979./3

1.06 The proposed sector loan would include IBRD financing of US$100 million to assist in raising the quality of higher technical manpower. Bank financing is sought chiefly for developing staff, teaching programs and laboratory facilities in the following fields:

Engineering Education (gr. 13-19)	US$60 million
Management Education (gr. 13-19)	US$ 4 million
Technician Training (gr. 13-14)	US$36 million

The proposed sector loan is recommended for Bank financing because it supports the Government's industrial development strategy, it addresses the major issues in higher technical education and it is well organized and financed to achieve its goals. The following sections of the report address each of these topics in turn.

/1 "Korea: Education Subsector Memorandum on Higher Technical Training," June 26, 1978, Report 1927-KO.

/2 "Final Report on the Proposed Fifth IBRD Education Project," Ministry of Education, Republic of Korea, February 1979.

/3 Consisting of Messrs. S.Z. Sung (technical educator, mission leader); P. Eklund (economist), R.M. Macdonald (management training specialist, consultant), J.C. Calhoun (engineering educator, consultant).

2. INDUSTRIAL DEVELOPMENT AND HIGHER TECHNICAL MANPOWER

Industrial Strategy

2.01 Korea's economic development strategy seeks to shift its industrial structure away from light, labor-intensive manufactures towards more skill-intensive manufactures, i.e., those with a higher technological content. This strategy is necessary to maintain a comparative advantage in international trade in view of:

(a) the expected increase in competition from developing countries with lower wage levels than those now prevailing in Korea; and

(b) protectionist restrictions in industrialized countries, which will work against increasing imports of high volume and low value-added goods.

This strategy is reflected in the Government's economic growth targets: GNP is expected to rise on average by 10% per year through 1991, exports would grow at around 15% per year, and manufacturing would increase its overall share in GNP from 30% to 45%. Output in the newer, heavy and chemical industries would dominate the growth and increase by 15% per year. The share of these newer industries in manufacturing output would rise from 50% at present to 65% by 1991, while that of light industry would decline from 50% to 35% over the same period. Textiles, clothing and footwear, industries which recently accounted for nearly 50% of Korea's total exports, would represent a 20% share by the late 1980s, while general machinery exports should increase from 15% to 50% of the total.

2.02 If this industrial strategy is to be successful, Korea must increasingly replace wholly imported technologies with locally generated and adapted technologies. To do this it must reinforce its capabilities in product and process engineering. Policies are required that encourage a selective importation of foreign advanced technologies, the diffusion of such know-how between firms and the acquisition of advanced technology particularly at the firm level. This in turn requires raised expenditures on research and development (R&D). Total R&D expenditure in 1977 was 0.7% of GNP, of which the industry share was 30%. However, by 1991, the Government expects to raise expenditure on R&D as a share of GNP to 2.5%, with the industry share at 60%. The Government has already introduced policies to strengthen the local capacity for research in order to shift the responsibility for technology transfer and development from the Government to industry. Fiscal incentives are being provided to develop the engineering capability in industry. Moreover, the Government has liberalized procedures and tax incentives for importing advanced technologies. At present, most firms lack the financial and technical capabilities to provide the design, testing and planning expertise needed to screen and select appropriate and economical technologies. Assistance in these activities needs to be given by specialized research institutes, engineering universities and junior technical colleges.

Implications for Higher Technical Manpower

2.03 The planned structural transformation of industry also necessitates changes in the composition of the work force to match manpower supply with demand. Effective operations using more sophisticated production technologies require (a) higher quality of present skills, (b) a broader range of skills and (c) greater proportion of highly skilled technical manpower in the labor force.

2.04 At present the supply of high quality professional, technical manpower is limited. Industry reports a long lead time for higher technical manpower entering employment to become productive (e.g., a typical orientation period for Korean engineers beginning employment is two to three years compared with about six months for new engineers in industrialized countries). This initiation period would likely be prolonged by the introduction of more complex technologies. Some on-the-job training will always be appropriate, but the present amount is needlessly long and inefficient. In the future as Korea moves towards greater technological content in its manufactures, on-the-job training cannot be expected to compensate for inappropriate training in higher education institutions. In addition, the prevalent downward substitution of engineers in employment (i.e., use of engineers to perform technician level tasks), is symptomatic of low quality technical training as is the dependence of firms on costly service contracts with foreign suppliers of advanced technologies. Improvements in the quality of existing skills will thus be needed to meet the requirements of the skill-intensive industries.

2.05 A broadened range of technical and managerial skills will also be needed to effect the planned changes in industrial orientation. The development (or adaptation) and application of new technologies will require new engineering skills in research, design and production. Important skill gaps include: the ability to screen and select new technologies that will be cost-effective once adapted to local labor and materials conditions; the ability to develop modern integrated production systems that go beyond simple batch processing and exploit opportunities for joint production and creating economies of scale; and the ability to establish testing and quality control schemes based on modern instrumentation. New management skills in finance, marketing and organizational methods are also required to raise industrial productivity. Success with the changing pattern of firm ownership, from family to corporate operations in particular, requires new knowledge for applying modern quantitative methods of firm management.

2.06 Finally, to effect the planned structural changes in industry, higher technical manpower will need to constitute a larger share of industrial employment. The proportion of engineers and technicians within industry is expected to rise from the present 2.9% to about 5% in 1991. Within heavy engineering and chemical industries, the proportion may be as high as 25-30% of total employment, compared to about 5% in modern light industry. In

absolute terms, government projections of net demand for university-trained engineers from 1977-91 show an additional requirement of about 165,000 (over the 1977 supply of 40,000); additional demand for engineering technicians from junior technical colleges is estimated at 135,000 (with a present supply of 12,000). The projection of net demand for university-trained managers amounts to 240,000 for 1977-91. Because these figures imply rapid growth starting at relatively low absolute levels, it will be essential to monitor continuously changes in demand by type of higher technical manpower in order to allow for timely adjustments in supply.

3. ISSUES IN HIGHER TECHNICAL EDUCATION /1

Overview /2

3.01 Despite the general strengths of Korean higher education (in coverage and efficiency, substantial changes are needed in the technical subsector to meet industrial requirements in the 1980s.

(a) Flexibility - The supply of technical skills must become more responsive to demands. At present rigid enrollment controls prevent the present supply of higher technical manpower from responding adequately to changes in demand. This accentuates or prolongs cycles of shortages and oversupply. Structural changes need to be introduced in the supply of technical skills so as to satisfy the rapidly changing requirements for technological growth in the 1980s.

(b) Quality - The quality of higher technical training relates poorly to present industrial needs and will become increasingly inadequate in the future. Recent enrollment growth has not been accompanied by commensurate increases in teaching staff and facilities. Acute teacher and equipment shortages have resulted. These shortages, together with insufficient adaptation of teaching content to industrial requirements, contribute to theoretical teaching which does not produce the practical, problem-solving abilities required by industry. Concerted efforts are needed to increase teacher supply, equip laboratories and develop more relevant teaching programs.

(c) Finance - A major financing gap exists in higher technical education. The subsector has been underfinanced over the past decade. Major new investments are required to support the planned technological transformation in the 1980s and the bulk of these investments fall on private institutions unable to afford them. Increased public expenditure in private education would help narrow, but not eliminate, the gap. In view of the expected continued shortage of investment funds, available resources should be concentrated in a limited number of high quality institutions and systematic accreditation should be introduced so as to establish, improve and equalize standards over the long run.

/1 The fields of study most closely related to industrial development in Korea include engineering and management education (at both graduate and postgraduate levels) and technician training (at diploma level). For the sake of convenience, these three types of education are called "higher technical education." Higher technical education is defined as the sector in this report.

/2 For a background description of higher technical education see Projects File and for a recent comprehensive analysis see "Korea: Education Subsector Memorandum on Higher Technical Training," June 26, 1978, IBRD Report No. 1927-KO.

Major Issues

Lack of Flexibility

3.02 Higher technical education is not well organized to respond to changes in demand for higher technical manpower. The output of graduates cannot be adjusted quickly to eliminate shortages or oversupplies. Current shortages and projected surpluses of technical manpower indicate this lack of flexibility in the system. Major shortages exist for engineers and managers, estimated to be about 10,000 and 45,000 in the 1977-81 period. Salary differentials reflect the growing scarcity of college-trained graduates. In 1971 the wage ratio between degree holders and persons with primary education was 3:1; in 1978 it had increased to 4:1 and was 8:1 for engineering graduates.

3.03 The Government recently undertook major expansion of the intake quotas in technical fields to overcome these shortages. Entrance quotas were raised in undergraduate engineering by 40% in 1978 and another 60% in 1979, by 35% in both years for technicians, and by 95% and 85% for management. Additional increases are being planned in 1980, as shown in Table 3.1:

Table 3.1: STUDENT ADMISSION QUOTAS

Undergraduate Field	Actual 1977	Actual 1978	Actual 1979	Projected 1980
Engineering	13,000	17,500	28,100	29,400/a
Management	4,300	8,400	15,500	20,500
Technicians	23,700	32,000	43,100	44,800/a

/a Increases announced in September 1979.

Source: MOE.

However, recent long-term manpower projections prepared by the Government suggest that, even without the planned 1980 increases, the system may have been overexpanded. Oversupplies of engineers and particularly of technicians are likely to emerge by the mid-1980s, as shown in Table 3.2.

Table 3.2: SUPPLY AND DEMAND PROJECTIONS FOR ENGINEERS, TECHNICIANS AND MANAGERS (1977-1991)

	1977-81	1982-86	1987-91	1977-91
Engineers				
Additional supply /a	27,200	64,700	90,800	182,700
Additional demand /b	38,700	52,000	72,300	163,000
Balance	-11,500	+12,700	+18,500	+19,700
Technicians				
Additional supply /a	33,600	83,000	106,800	223,400
Additional demand /b	16,700	42,100	74,600	133,400
Balance	+16,900	+40,900	+32,200	+90,000
Managers				
Additional supply /c	18,000	89,000	92,000	199,000
Additional demand	65,000	75,000	100,000	240,000
Balance	-47,000	+14,000	-8,000	-41,000

/a Including projected quota increases for 1980.

/b Demand projections are based on the Government's long-term economic plans, and were prepared by the Korea Educational Development Institute (KEDI). The future demand for engineers produced by engineering colleges, is assumed to rise from 80% in 1975 to 86% by 1991; for technicians produced by junior technical colleges, an increase is assumed from 10% in 1975 to 70% by 1991; for management projections refer only to output of college and university level programs. Demand projections do not allow for teacher requirements.

/c Supply derived holding 1981 planned quota constant.

Source: KEDI and mission projection for management education.

3.04 Shortages and oversupplies are bound to occur because of the inflexibility of the present system of enrollment control and the lack of a permanent capacity for manpower projections. The size and composition of higher technical education is controlled by a quota system through which the number of entering students is determined by the MOE centrally for each institution and department. This quota system was intended to regulate supply with demand and ensure minimum standards among entering students. However, a systematic manpower analysis has not been done and little permanent capacity exists for analyzing and forecasting demand for higher technical manpower. Manpower projections have been carried out on an ad hoc basis by the EPB, MOST, KEDI and the Korea Development Institute (KDI). The most recent projection was carried out by KEDI. A permanent analytical capability is needed with appropriate methodologies and information base for planning the size and composition of higher technical education.

3.05 Manpower planning in Korea is made difficult by the unusually long lead time between entrance to university/college and entry to the labor force. Male students are required to fulfill three years of military training beginning at age 20. Seven years may therefore elapse between entry to tertiary education and entry to the labor market. Students have to decide their area of specialization upon entrance to the institution, long before labor market demands are known. Institutions can respond only slowly to changing market demands since it takes up to seven years before altered curricula or intake quotas begin to have an impact on the labor market. Korea needs to develop a more flexible system for supplying higher technical manpower to satisfy the rapidly changing needs of technological growth in the 1980s.

Quality Problems

3.06 The quality of higher technical training is inadequate for the technological changes sought in industrial development. A few institutions produce satisfactory engineers and technicians, particularly in civil engineering and architecture, but standards vary widely among institutions. At all institutions the teaching programs lack practical content. Theory is generally well taught but there is a lack of emphasis on its application through experiments and problem solving. Some teaching programs are outdated and some needed skills are not being taught. Low quality is manifest in three areas: teaching content, teaching staff and equipment.

3.07 Teaching Programs. Teaching programs in higher technical education are characterized by early specialization, lack of practical content and poorly developed graduate programs. The structure of curricula fails to achieve a suitable balance between specialization in one field and sound basic skills. The average undergraduate engineering program allocates only about 9% for general engineering but 56% of course time for specialization. Early specialization is also a characteristic of undergraduate business management courses.

Students are allocated to specific departments early in their careers, including business management, economics, trade, commerce, industrial management and statistics. Fragmentation of courses is combined with a lack of standardization between schools. Junior technical colleges, moreover, provide a relatively rigid and terminal two-year course which emulates programs provided by four-year engineering colleges. Few opportunities are provided for further training or retraining. The early specialization stems largely from the Government's quota system which admits students to each institution by department. Graduates who lack adequate basic skills are not well prepared to adapt to different industry-specific needs. This is particularly detrimental to industrial technicians who are often called upon to perform a broad range of tasks.

3.08 Teaching programs also do not provide enough practical applications of theory taught. Laboratory work and practice in engineering account for only an average of 8% (8-14 units of the total 140 units) in a student's undergraduate career, compared with 30% in more advanced countries. Management education lacks a problem-solving orientation, as indicated by the virtual absence of case studies on the solution of management problems in the Korean context. In addition, teaching programs are often obsolete and do not provide the types of skills now needed by industry. There is relatively little emphasis on industrial and process engineering which is needed for more efficient manufacturing methods and production efficiency. Management curricula do not include industry specific courses and devote inadequate attention to such topics as business policy, strategic planning, and management information systems. The failure to keep teaching programs up to date results from the absence of a continuous dialogue with industry on training content and from the quota system which discourages experimentation with multidisciplinary training programs. As Korea enters a new phase of industrialization, basic skills training will need to be strengthened and a broader range of options taught. Coordination between training institutions and industry must be increased to assure the relevance of teaching content.

3.09 The Supply of Teachers: The teacher shortage is a major factor adversely affecting the quality and type of instruction given. Staff shortages are reflected in large class size and are particularly acute in engineering and management. The student:staff ratio in engineering is 44:1 (80% higher than the average of 24:1 in higher education as a whole); ratios above 50:1 commonly occur in less prestigious universities/colleges. The teacher supply is even more constrained in management. The overall student:staff ratio is 69:1, but there is a wide variation. In 1979, only 7 out of 60 institutions had student:teacher ratios of 40:1 or below. Over half the students faced ratios exceeding 130:1. Even if there were no increases in admissions to engineering and management beyond 1979, and teacher recruitment proceeded at the present pace, the student:staff ratios would still rise to 55:1, and 110:1, respectively, by 1982. The shortages of teaching staff between 1979 and 1982 would increase from 500 to 2,500 in engineering and from 200 to 1,000 in management (as measured against student:teacher ratios of 21:1 and 40:1, respectively).

3.10 Korea has had difficulty in recruiting qualified teaching staff. In 1979 faculty recruitment amounted to only 170 teachers for engineering, less than 30% of the planned increase, and 30 for management education, less than 10% of the target. About 400 junior college staff were recruited for technical level training in engineering, about 60% of the 1979 target./1 Staff shortages are caused mainly by supply constraints and unattractive incentives for entering the teaching profession. Postgraduate programs in engineering and management produced only 1,220 and 700 graduates, respectively, in 1979. These low levels of output stem from difficulty in recruiting students into graduate school. In 1977, for example, only 80% of the student intake quota was met for masters degrees in engineering and only 40% for doctoral programs. Available graduates preferred industrial employment which pays 33-100% higher salaries than teaching. A recent survey on engineers' salaries found that the pay for teaching staff (from W 214,000 for an instructor to W 360,000 for a full professor) ranged from 75% to 50% of comparable wages in industry. In management the average teacher receives even less in relative terms: from 40% for assistant teachers to 50% for associate professors. The pay differentials reflect industry's strong demand for highly qualified manpower and its relatively elastic wage structure, while the Government bases teachers' salaries in public institutions (closely matched by private institutions) on the regular civil service schedule. Further, few institutions can attract faculty through opportunities for professional development, research or industrial consultancies. The average annual research fund for the 26 management research institutes was only US$7,500.

3.11 Staff shortages reinforce the tendency towards theoretical instruction. The lack of staff in technical fields means they must carry heavy workloads. Engineering and management staff handle an average of more than 20 classroom sessions weekly (more than double the average for other fields), with about 40-60 students per class. Under these conditions, it is difficult for teachers to supervise practical work or analyze case studies. Consequently, training fails to cultivate the practical, problem-solving abilities required by industry.

3.12 Qualifications of Teaching Staff. Not only are teaching staff in short supply, their qualifications need improvement. This applies particularly for staff in junior technical colleges and for industrial experience of staff in all fields. Because of the shortage of qualified graduates interested in teaching, too few faculty have been employed with high quality, advanced degrees. Over half the staff of junior colleges are recruited directly from undergraduate courses for technical secondary school teachers or from engineering courses with no pedagogical training. The formal qualifications of staff in engineering and management are reasonably good (38% of engineering and 28% of management staff hold doctorate degrees, mainly from local institutions), but less than 5% of all teaching staff have had any

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/1 This was achieved by relaxing qualification standards so that teaching staff were recruited largely from among recent graduates rather than postgraduate programs.

industrial or commercial work experience. Staff lacking appropriate qualifications and industrial experience tend to rely extensively on lecture/demonstration techniques since they are ill-prepared to guide students in industrial experiments and research.

3.13 Equipment. Laboratory equipment is indispensable for the effective training of engineers and technologists. However, laboratory equipment and materials are in short supply and this constrains the quality of education particularly in engineering and technician programs. Expenditures on equipment have increased lately, but they have not kept pace with increases in enrollments. Existing laboratory equipment in engineering and junior technical colleges meets only about one fifth of the MOE standard of US$3,000 per student./1 The shortage of equipment compounds the difficulties of staff in providing practical instruction. The lack of adequate equipment and materials reinforces the reliance on the lecture approach and reduces the possibilities for practical work by students in technical fields. On the average students can perform only about one-fifth of the amount of laboratory work required, which is already insufficient. Graduates are, accordingly, deficient in performing practical jobs which leads, in employment, to inefficient design, and ineffective quality control.

Investment Gap in Private Education

3.14 A major financing gap exists in the subsector. Higher education in Korea has tended to be underfinanced. Historically the Ministry of Education has allocated only about 6% of its budget for higher education, the lowest figure among Asian countries. This low percentage is explained mainly by the fact that about three-fourths of the higher education institutions are private and receive little, if any, funds from the Government. Student fees, regulated by the Government, provided about 85% of the total revenue of private colleges and universities. Large class sizes and low investment in equipment yielded low recurrent costs per student averaging US$400 in private engineering colleges, only two thirds the level in public institutions. These levels of expenditure represented underfinancing in relation to the needs, particularly for teaching staff and facilities in technical fields.

3.15 Such underinvestment cannot continue if higher technical education is to support the technological transformation planned in the 1980s. Major new investments are required. Total investments of about US$830 million (constant 1979 prices) are needed for the period 1979-83 in equipment, facilities and software to accommodate new enrollments and raise the standard of higher technical education to acceptable levels. About 40% of this

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/1 The standard equipment lists appear reasonable and modest. Based on current enrollment per department, the standards correspond to about US$3,000 in equipment per engineering student and US$3,000 per technician student. These standard list were introduced in 1974 and revised in 1978. Despite their limitations (e.g. equipment is specified by department without provision for enrollment variations) they are valuable planning tools.

investment, or US$315 million, would be required for national programs and investment in public institutions. The Ministry of Education would probably be able to finance the projected costs for public institutions. However, 60% of the financial burden for quality improvement would fall on private institutions. Private institutions, with financial resources limited mainly to student fees regulated by the Government, are unlikely to be able to afford investments of US$515 million. Data are not available to permit a precise projection of the size of the gap. However, taking into account endowments and other resources available to private institutions and industry contributions, they would probably be able to raise only roughly 25% of the required investments, or from $125-150 million. A gap of nearly $400 million would, therefore, remain. The foreseen inability of private education to meet the financial requirements for expansion and quality improvement poses an important issue for the Government.

3.16 Measures to increase investment at private institutions include raising student fees and introducing student loans, increased public subsidy and the use of tax exemptions on industrial donations. In view of the Government's industrialization plans there appears to be a strong case for increased public subsidy of private institutions. This could take the form of grants for staff upgrading and loans on favorable terms for laboratory equipment and buildings together with the requirement of matching funds to stimulate direct assistance by industry. Increased public expenditure on private higher technical education would help narrow, but would not eliminate completely, the investment gap. A segment of private institutions would remain of low quality into the mid 1980s. In view of this expected shortage of resources, the Government strategies should: (a) concentrate available resources in a limited number of institutions in order to produce a minimum number of well-qualified graduates; (b) introduce a comprehensive system of accreditation so as over the long run to establish, gradually improve and equalize standards throughout the country; (c) increase public financial assistance to private institutions; (d) introduce incentives, such as tax exemptions, to encourage contributions by industry, and (e) permit private institutions to raise the level of student fees.

4. SECTOR PROGRAM ON HIGHER TECHNICAL EDUCATION

Strategy

4.01 The proposed sector program, including assistance for engineering, management and technician education,/1 directly addresses the major issues in higher technical education. It would help create a more flexible system of supplying technical skills, help remove the principal constraints on quality improvement and help reduce the projected investment gap. The costs of the proposed loan include expenditures on establishment of new institutions, policy studies, curriculum development, teacher recruitment and training, buildings, equipment and materials.

4.02 Flexibility. A central aim of the sector program is to shorten the periods of manpower shortages and surpluses. It would help introduce more flexibility into the planning and the management of higher technical education: in the future this system would respond more readily and quickly to changes, quantitative and qualitative, in labor market demand. This objective would be accomplished by:

(a) establishing a permanent capacity for manpower analysis and continuous monitoring so that it would be possible to adjust supply more readily to foreseen changes in labor market demand, by broad categories;

(b) replacement of the centrally controlled quota system with a system for admissions and management of universities and colleges which enhances the transfer of students between departments and schools while maintaining minimum standards among entering students;

(c) the deferment of early specialization in favor of broad general training with the possibility of transfer between fields in line with supply/demand changes; and

(d) the introduction of in-service and retraining programs to ease the transition of surplus manpower to fields in demand.

4.03 Quality Improvement. The main emphasis of the sector program would be to bring the quality of higher technical training up to the standards needed for industrial development in the 1980s. Such quality improvement would be accomplished by:

(a) establishing accreditation agencies to set and enforce appropriate training standards;

/1 For a separate account of the programs by type of education, see "Final Report on the Proposed Fifth IBRD Project," (op.cit.).

(b) adapting the content of existing teaching programs to industrial requirements, and introducing new programs to strengthen analytical and practical skills;

(c) increasing the supply, and improving the qualifications of teaching staff; and

(d) providing more laboratory equipment for teaching purposes.

4.04 Investment in Private Education. A third objective of the sector program is to lessen the investment gap in private higher technical education by:

(a) channelling sector loan funds to private institutions for staff development and equipment;

(b) channeling additional public funds into private institutions; and

(c) studying the feasibility of increasing revenue to private institutions through raised student fees.

These financial measures are discussed in Chapter 6.

Program Content

Adjusting Manpower Supply and Demand

4.05 A manpower monitoring system would be established to help regulate the supply of higher technical manpower in accordance with demand. The monitoring system would carry out continuous analysis of manpower demand in industry with a view to recommending necessary adjustments in the supply of trained manpower, both by level and type of manpower. The monitoring system would include the annual collection and assessment of data on manpower demand and supply, employment and technological changes in industry as they relate to manpower requirements. The system would develop three main sources of information, as follows:

(a) tracer studies of graduates (employment rates, salaries, vertical mobility and job performance) in collaboration with the MOE;

(b) forecasts on industry specific technology needs in order to determine emerging skill requirements, in cooperation with MOST; and

(c) general manpower projections based on five-year development plans, occupational coefficients of major economic sectors; and data on productivity and relative wage movements.

The initial scope of operations would be limited to higher technical fields, but later would be expanded to encompass all skill categories. On the basis of information derived from this monitoring system, recommendations would be made to the MOE to adjust enrollments.

4.06 Initially, the manpower monitoring system would be built up under the existing, but dormant, Committee for Manpower Development and Promotion in the EPB. In a second phase, to be completed by the end of 1981, a permanent manpower institution would be established either under the EPB or MOE. The proposed program would include financing for expert services to assist in establishing the manpower monitoring system. During negotiations, it was agreed that the government would evaluate before June 30, 1980 its existing Committee for Manpower Development and Promotion and ensure that it performs the functions of a manpower monitoring system satisfactory to the Bank before December 31, 1981.

4.07 The achievement of a more flexible manpower supply system for the 1980s also requires replacement of the rigid and centralized quota system which controls admission of students by institution, department and field of study. The new system should be decentralized (i.e. available student places would be determined by each institution in accordance with overall guidelines), be based on qualitative criteria and permit transfer of students between departments and across fields in response to labor shortages or surpluses. During negotiations, it was agreed that before December 31, 1980, the government would submit to the Bank for its review and comments, proposals for a flexible system for allocation of students in higher technical education which would facilitate adjustment of supply of higher technical manpower in accordance with changes in labor market demands and implement, in consultation with the Bank, such proposals before December 31, 1981.

4.08 Until a more flexible system of manpower supply is achieved, the Government has adopted a moderate policy on further expansion of enrollments./1 In view of the sharp increases introduced over the past two years, any major expansion of intake in technical fields is likely to worsen the employment prospects of graduates and the quality of education. To avert supply imbalances in the 1980s and further strains on teaching equality, the Government has agreed to proceed cautiously in raising admission quotas for engineers and technicians until such time as manpower information and improved quality suggest a need for further expansion. During negotiations, the Government and Bank agreed that during the the Bank's regular review missions in the first quarter of each year until 1984, the annual levels of admission for engineer/technicians would be discussed. The discussions would consider the most recent information available such as revised manpower projections for engineers and technicians, average wages by field of specialization for the three most recent years, tracer studies, i.e. the employability and wages of

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/1 For example, the quota increases in engineering originally intended for 1980 have been considerably reduced from 15,000 to 1,300 students.

new graduates of sampled institutions, etc. The objective of this discussion would be to establish general guidelines for the overall annual enrollment increases by major field of study.

Quality Improvement

4.09 Accreditation. Under the proposed sector program, the Government would establish an accreditation system for assessing the quality and relevance of education and establishing appropriate training standards. Two elements of this system, namely (a) The Korean Management Education Board, and (b) The Technician Education Research Institute have already been established. The government intends to submit plans for the establishment of a third agency, for engineering education, to the Bank before June 30, 1980 and to establish it before January 1, 1981. These agencies would be generally responsible for assessing the quality of existing training institutions in their respective fields, setting minimum professional standards for training in terms of staff, curriculum and facilities, proposing remedial measures to correct quality deficiencies and, ultimately, for extending accreditation to institutions through the MOE. The evaluation and accreditation of institutions would be carried out through the use of external examiners. In addition, the institutions would carry out ad hoc studies on particular issues (e.g., cost analysis) and help develop more relevant training programs. Their scope of responsibility would cover private as well as public institutions.

4.10 Each agency would comprise about 5-10 professional staff, assisted by ad hoc experts and consultants. The agencies would serve as secretariats for existing MOE Evaluation Committees and would include representatives of industry, public and private institutions and Government on their boards. The project costs associated with accreditation include the establishment of the agencies and their initial operating costs, specialist services and the costs of about ten studies. During negotiations, the Government agreed to establish a third agency (for engineering education) by January 1, 1981 and thereafter maintain the three accreditation agencies in the fields of engineering, technician training and management with terms of reference acceptable to the Bank.

4.11 Curriculum Development. A major objective of the program is to strengthen the analytical and practical skills of higher technical manpower through improved teaching programs. The content of existing programs would be changed and new curricula would be introduced. These new teaching programs would be prepared by selected colleges/universities with assistance from the respective accreditation agencies. Curricula for engineering courses would be improved by:

(a) increasing the credit requirements for basic science and engineering subjects from about 24% to about 40% of available time;

(b) increasing the requirements for practical (laboratory) work from about 10 credits on the average to about 25 credits;

(c) adding new engineering programs, particularly in industrial engineering, operations research and instrumentation; and

(d) allowing for the development of multidisciplinary courses. At the postgraduate level, a multidisciplinary approach to problem solving would be fostered by the creation of four interdisciplinary centers which would utilize the resources of several departments in applied research programs.

4.12 Management education would be modernized using teaching materials and techniques relevant to Korea. Course contents, which vary widely among institutions, would be standardized with assistance from the management accreditation agency. Case studies would be developed based on Korean examples and new specializations would be developed (for instance in accounting and financial analysis) based on the use of modern quantitative techniques. The Graduate School of Seoul National University would sponsor most of this curriculum development through support of case-writing and case-teaching seminars for 60 teaching staff annually between 1980-84. The technician-training curriculum would also be made more flexible through adoption of a modular approach allowing for two types of training. The first type would be designed to prepare technicians for employment in small- and medium-sized industries and would provide a broad range of basic skills; the second type of training would prepare students for employment in large industries and would cover fewer skill areas but in greater depth. The proposed program would provide specialist services as needed to assist the agencies involved in curriculum development for the whole subsector.

4.13 Increasing the Supply of Staff. The main requirement for improvements in the quality of higher technical education is to eliminate shortages and increase the supply of well-qualified staff. Under the loan, the supply of teaching staff would be trebled from about 4,000 to 12,000 staff so as to achieve reasonable student:staff ratios at the undergraduate level of 21:1, 40:1 and 18:1 for engineering,/1 management and technician courses, respectively, by 1986. This increased supply of teachers would enable students to receive more individual guidance and practical instruction in laboratories.

/1 The ultimate aim is to achieve a student:staff ratio of 15:1, but the higher ratios have been adopted in the interim due to staff shortages that cannot be completely overcome by the end of the plan period in 1986.

Table 4.1: REQUIREMENTS FOR NEW TEACHING STAFF (1979-86)

Type of training	Existing staff (1978)	Additional Staff Required (1979-86) Incremental	Replacement	Total	Target Student Faculty Ratio (1986)
Engineering					
Undergraduate	1,330	3,900	200	4,100	21:1
Graduate	100	260	-	260	15:1
Subtotal	1,430	4,160	200	4,360	
Management					
Undergraduate	280	1,750	50	1,800	40:1
Graduate	20	250	-	250	20:1
Subtotal	300	2,000	50	2,050	
Technicians	2,250	2,300	300	2,600	18:1
Total	3,980	8,460	550	9,010	

Source: MOE.

4.14 The expansion of teaching staff would be achieved by increasing output from postgraduate engineering and management programs, enlarging overseas fellowship schemes and instituting special postgraduate programs to produce teachers. In addition, Korean engineers working abroad would be recruited as teaching staff for postgraduate engineering training, and part-time staff would be recruited from industry. Incentives would be adopted to attract students into graduate schools and staff into teaching. The subsector program would finance the expansion of graduate programs (facilities and equipment), overseas fellowships, expert services and costs of recruitment of staff from overseas. Table 4.2 indicates the estimated sources for the additional staff needed. Similar scholarship schemes have been successful in the past and experience with recruitment of staff from overseas has been favorable. The feasibility of significant numbers of part-time staff from industry, however, has not yet been tested. Altogether these programs would meet about 90% of the total requirement of 9,000 by 1986. The Government has submitted supplementary staff development plans for reducing the expected deficits.

Table 4.2: SOURCES FOR ADDITIONAL TEACHING STAFF REQUIRED, 1975-1986

	Engineering		Management			
	Graduate (1)	Under-graduate (2)	Graduate (3)	Under-graduate (4)	Technician (5)	Total
Staff required (1986)	260	4,100	250	1,800	2,600	9,010
Sources of additional staff						
(i) Local graduate school						
(a) regular	-	1,400	120	1,500	1,800	4,820
(b) special	-	2,030	-	-	-	2,030
(ii) Overseas fellowships	-	150	30	-	150	330
(iii) Overseas recruitment	150	-	-	-	-	150
(iv) Industry (part time)	100/a	40/a	-	-	) 650	790
and other	-	-	-	-	)	
Total	250	3,620	150	1,500	2,600	8,120
Surplus or (deficit)	(10)	(480)	(100)	(300)	0	(890)

/a Full time equivalent.

Source: MOE estimates.

4.15 The increased supply of teaching staff would be produced largely through expansion of domestic graduate school programs. Existing programs would be expanded and special teacher-training programs would be introduced as shown in Table 4.3.

Table 4.3: PLANNED EXPANSION OF POSTGRADUATE PROGRAMS
ENROLLMENTS AND OUTPUTS
(1979 Actual, 1986 Planned)

Type of postgraduate training	Enrollments		Outputs			Estimated number becoming teachers /b
	Actual 1979	Planned 1986	Estimated 1979	Planned 1986	Accumulated total 1979-86	
Engineering						
Masters						
Regular program	1,890	4,400	800	2,000	11,200	1,130 (10%)
Special program /a	300	0	0	360	2,070	1,470 (70%) /c
Doctoral						
Regular program	240	660	70	200	1,080	270 (25%)
Special program /a	0	400	0	160	560	560 (100%)
Management						
Masters	2,200	5,800	1,000	2,400	12,800	1,200 (10%)
Doctoral	200	260	60	80	560	300 (50%)
Technicians						
Masters	60	300	-	150	720	720 (100%)

/a A peak enrollment of 1,400 would be reached in 1983 with 800 in masters programs and 600 in doctoral programs.

/b Figures in bracket represents the percentage of the accumulated output entering teaching.

/c Excluding the 600 masters degree holders who are expected to proceed to doctoral programs.

Source: MOE.

4.16 The feasibility of expanding domestic graduate school programs depends on the recruitment of additional graduate school professors and students to enter graduate schools and eventually teaching. Korea has had difficulty in both areas of recruitment (para. 3.10). The Government has prepared a program to attract more students into graduate schools and into teaching. The program includes the following:

(a) The average salaries for teachers in higher education have been substantially increased in 1979 as shown in the following table and the gap between faculty and industry salaries has narrowed:

Table 4.4: AVERAGE SALARIES OF TEACHERS IN HIGHER EDUCATION

	1978 (Won)	1979 (Won)	Increase (%)
Professor	438,000	639,000	46
Associate professor	380,500	513,000	35
Assistant professor	290,000	403,000	39
Instructor	249,500	338,000	35
Part-time instructor	140,400	190,000	35

(b) The legislation on military services has been revised and approved by the National Assembly. Three years of military services will be reduced to one for students pursuing graduate studies in engineering and natural sciences.

(c) A law on Research Promotion and the establishment of a research promotion fund was recently passed at the National Assembly. Professors have access now to research funds and those whose applications for such funds are approved have income in addition to their salaries.

(d) The enlarged scholarship schemes recently approved at the graduate level for engineering, management and technicians education (at a cost of about Won 1 billion per annum) are shown in Table 4.5.

Table 4.5: ENLARGED SCHOLARSHIP SCHEME

	No. of scholarships per year			Amount of scholarship (W p.a.)
	Engineering	Management	Technicians	
Master level	400	100	150	500,000
PhD level	50	50	80	700,000
Total	450	150	230	

Moreover, the Government agreed during negotiations to take all necessary steps to introduce incentives for recruitment and retention of teachers at graduate and undergraduate levels to achieve not later than December 31, 1986 the following targets of student/teacher ratios:

(students per staff)

	Graduate level	Undergraduate level
Engineering	15	21
Technicians training	-	18
Management	20	40

4.17 Additional measures are planned to supply teaching staff, including overseas fellowship programs which would train about 330 staff at PhD level within the next five years./1 In the interim, recruitment of Koreans employed abroad and adjunct professors from industry would supply postgraduate teaching staff in engineering. Special incentives, including travel and housing benefits, would be introduced to attract about 150 qualified Koreans working abroad to assist, in particular, with the special postgraduate faculty training programs. Another 300 engineers would be recruited each year from industry for teaching on a part-time contract basis (for a minimum of three years). A special law was passed in 1979 to enable regular appointment of visiting professors from industry and commerce who are inadequately qualified but have up-to-date industrial experience, to teach at universities and junior technical colleges.

/1 Fellowship recipients sponsored by the government are required on completion of their studies to work in appropriate teaching positions for a period of time equal to twice the length of their studies.

4.18 Improvement of Staff Qualifications. The qualifications of existing staff would be improved under the sector program and a larger proportion of staff would hold advanced degrees by 1986, as shown in Table 4.4.

Table 4.6: PROPORTION OF TOTAL TEACHING STAFF WITH ADVANCED DEGREES

Field of Study	1977 (% of total	1986 teaching staff)
Engineering (PhD)	38	43
Management (PhD)	28	50
Technician (Masters)	43	70

4.19 Upgrading of staff would be accomplished by strengthening and expanding local graduate programs; providing overseas fellowships to present staff; creating faculty exchange programs with industry; and providing workshops and seminars to familiarize teachers with local industrial/commercial practice. The training programs would be organized by the Ministry of Education to assist in staff development as shown in Table 4.7:

Table 4.7: TRAINING PROGRAMS FOR PRESENT TEACHING STAFF

	Engineering	Management	Technician
Doctoral programs (local)	400	40	-
Nondegree fellowships	1,020	100	250
Workshops/seminars	500	700	2,400

4.20 In engineering, selected universities would receive funds for additional equipment, operating costs and research support according to the number of doctoral candidates they accept under this program. Nondegree courses would be provided mainly through foreign fellowships. About 1,020 engineering doctorate holders would receive one year overseas research fellowships; about 100 management education staff would undertake foreign research or study assignments lasting three months to a year; about 250 technician training staff would receive professional training abroad concentrated on increasing their practical experience.

4.21 Technical personnel can quickly become obsolete unless their education is continually updated, particularly if Korea is to compete in a world market where some products are based on rapidly growing scientific technology. Continuing education for practical engineering at the site of

industry and university is important and would be supported under the program. Workshops and seminars would also therefore be a feature of the staff upgrading program. In engineering 500 staff would attend seminars on professional subjects in management education, a two-month Management Professors' Program would provide annually local training in modern pedagogy for 50 professors; in addition 60 management staff would attend workshops on case-writing and workshops on the introduction of new teaching materials. About 2,400 technican staff would attend workshops at Chungnam to receive training in industrial trends and pedagogy. Joint programs with industry, organized annually for 250 engineering staff, would include a short period of employment, executing of industry-related projects and special studies of industrial firms.

4.22 Equipment and Teaching Materials. One of the major impediments to practical education is the acute shortage of laboratory equipment and teaching materials, averaging only about 20% of the MOE standards. Additional investment in teaching equipment is an essential requirement in the reorientation of instruction toward problem solving and practical applications. The sector program aims at increasing equipment provisions from an average of 20% of the MOE standard to about 70% overall in engineering and technician fields, or from US$500 per student to about US$2,000 per student. Full attainment of the MOE standard would require unrealistically high investments in the near term and would need to be deferred to the latter part of the 1980s. Priority in the allocation of equipment funds would be given to:

(a) selected fields, such as electronics, industrial, mechanical, electrical, and chemical engineering, in which 100% of the MOE requirement would be reached;

(b) basic laboratory facilities in which teaching concentration would be increased;

(c) special graduate school programs for training teaching staff; and

(d) institutions that consolidate resources and share large equipment items.

The proposed investment in equipment would enable laboratory work to be increased in engineering from about 10% to 30% of available time and in technician training from about 20% to 40%.

5. MANAGEMENT AND IMPLEMENTATION

5.01 Management arrangements have been well organized for execution of the sector program. These arrangements include:

(a) a sector approach for managing the complex program;

(b) effective plans for organization and staffing;

(c) well defined and tested implementation procedures;

(d) relevant criteria for allocation of loan funds; and

(e) a realistic implementation schedule.

These arrangements are discussed in turn below.

The Sector Approach

5.02 The improvement program for higher technical education would be composed of national programs, and subprojects for particular institutions. It is expected that the overall program would include about 10 national programs and about 55 institution subprojects. National programs would cover the whole subsector, public and private, and would include such activities as creation of the manpower monitoring system and accreditation agencies, as well as curricula and staff development (fellowship) programs. Subprojects would pertain to a specific college or university and would include provision of equipment, materials, and construction of physical facilities.

5.03 A deliberate effort has been made in formulating the program to rely as much as possible on the borrower as regards both procedures and allocations of funds. An intermediary institution, the Ministry of Education, would assume responsibility for the identification, preparation, appraisal, approval and supervision of subprojects. Recipient institutions, individual colleges or universities, would submit loan applications to the MOE for assistance. These loan applications would be appraised and approved by the MOE in accordance with methodology and criteria agreed with the Bank. Project management would be accountable to an interministerial committee headed by EPB and to periodic review by the Bank.

5.04 This approach would be the most effective and efficient way to execute the improvement program for higher technical education. The program is complex, covering about 55 institutions with varying needs and involving both hardware and software elements. Bank review of the technical merits of assistance to, and detailed supervision of, each institution would not be workable for this number of subprojects. Appraisal and supervision of subprojects could be done more efficiently by the MOE than by an external agency. The requirement that each institution submit a loan application would also be an effective way to allocate loan funds. The approach would help ensure that:

(a) the needs of each institution are adequately covered in the subprojects;

(b) the most interested and committed institutions participate in the program; and

(c) loan funds are allocated for the best proposals through competition.

Organization and Staffing

5.05 The Government has devised an effective organization plan and an adequate staffing plan for implementing the program.

5.06 Organization. The organization plan relies on existing line agencies in the MOE, builds on their strengths and includes appropriate checks and balances. Diagram 5.1 shows the principal agencies responsible for execution. Overall responsibility for implementation of national programs and subprojects would be divided between the CEB and IEB (educational aspects) and EFB (physical aspects). The Educational Facilities Bureau (EFB), which has had extensive previous experience in executing Bank education projects, would be responsible for planning and supervising the physical aspects of project implementation and for general coordination of the program and liaison with the Bank. The EFB has demonstrated its competence to handle the central role in project implementation. It was established within the MOE to execute the Bank's First Education Project (Credit 151-KO) and subsequently developed into a well-organized department with an experienced staff able to assume responsibility for all MOE construction programs, including those of later Bank projects (Credit 394/Loan 906-KO, and Part of Loan 1096-KO). EFB, in conjunction with OSROK, would have overall responsibility for the procurement of instructional equipment and delivery to project institutions. EFB would also be responsible for reporting to the Government and the Bank.

5.07 The College Education Bureau (CEB) in the MOE would manage the educational aspects of university (engineering and management) education, and the Industrial Education Bureau (IEB) that of technician training. Within this context CEB and IEB would be responsible for implementing technical assistance programs under the project e.g., selecting and appointing local or foreign specialists, assigning their duties, and organizing fellowship schemes and in-service training. CEB and IEB would further oversee the establishment of the accreditation system, including the secretariats for the three evaluation subcommittees. The accreditation agencies and selected educational institutions would be jointly responsible for the development of curricula, teaching materials, case studies and improved delivery systems.

5.08 Two committees, the newly created Deliberation Committee /1 and the existing interministerial Planning and Management Committee (under the

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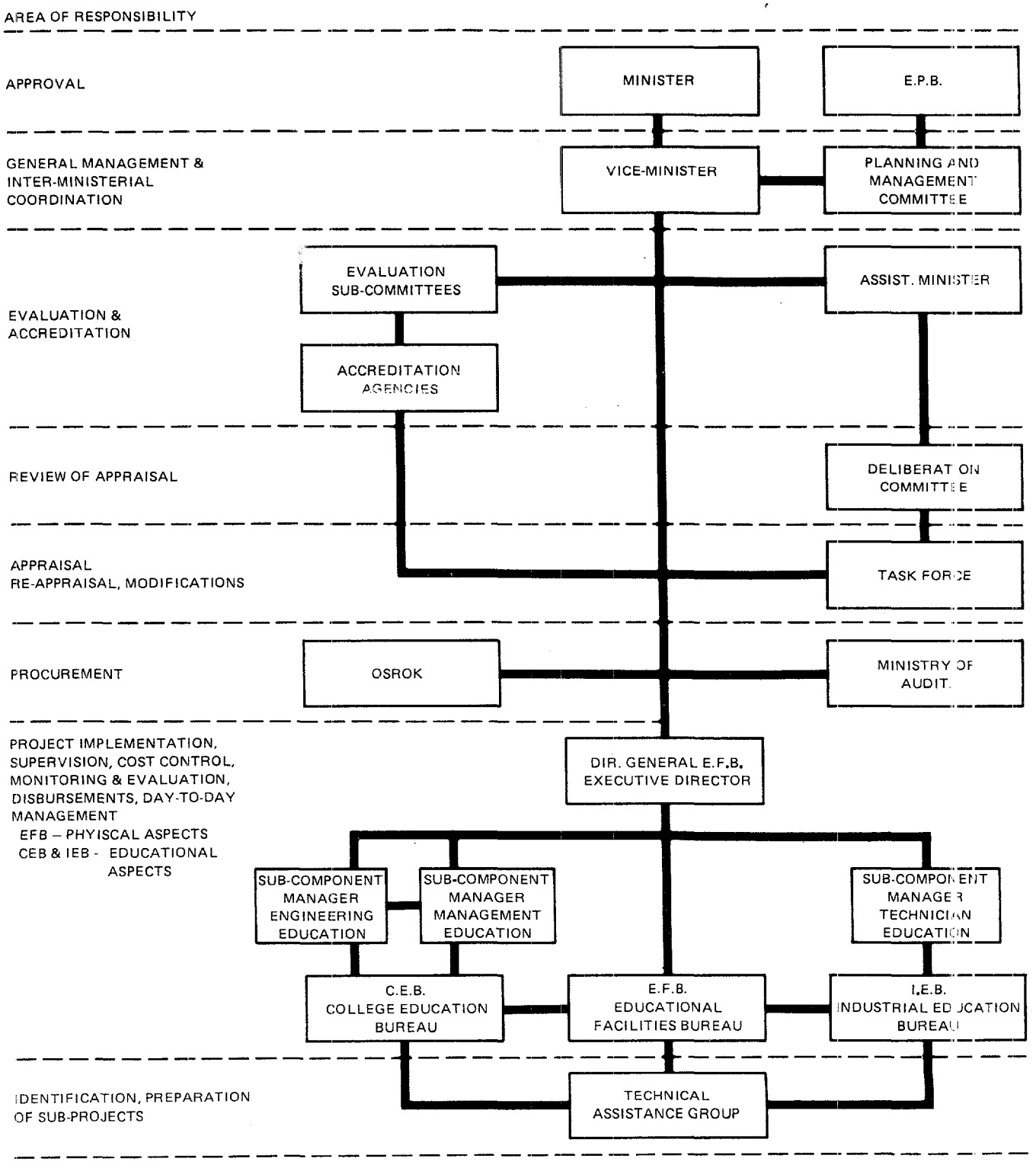
/1 This Committee has recently been established within the MOE and includes members from public and private institutions of higher education and representatives of research and industry.

Diagram 5.1

KOREA
HIGHER TECHNICAL EDUCATION SECTOR PROGRAM
Organization and Responsibilities for Management



Economic Planning Board) would play important roles in reviewing subproject documents (subloan applications, and appraisal and implementation reports) and settling unresolved questions on approval of subprojects.

5.09 The Vice Minister of Education would coordinate loan activities handled by EFB, CEB and IEB. The position of Executive Director, with responsibility for day-to-day implementation of the proposed sector loan, would be held by the Director General of the EFB. In addition, three persons would be designated subcomponent managers (two in the CEB for engineering and management education and one in the IEB for technician education).

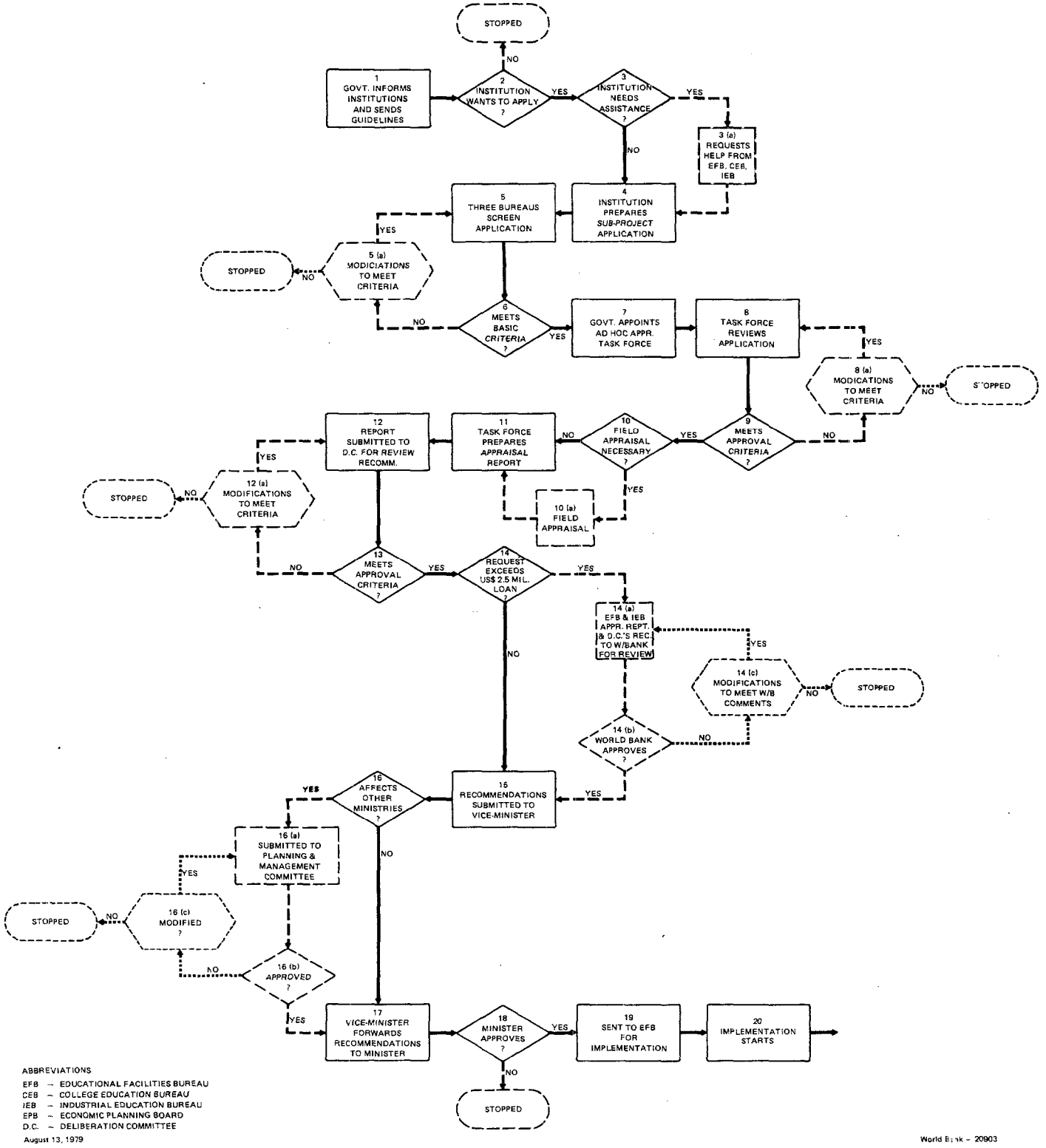
5.10 Staffing. The Government has taken steps to assure that the implementation agencies would have sufficient competent staff to manage the proposed sector program. The key agency, the EFB, doubled its staff in 1979 to about 125 and plans to have 150 staff by 1980 in anticipation of the workload imposed by execution of the proposed program. In addition, existing staff of EFB would be able to assume new tasks under this loan when previous Bank projects are completed in early 1980. The staff level is sufficient to handle the planning and supervision of equipment procurement under the project, as well as maintaining EFB's responsibility for civil works for all other schools in Korea. The procurement agency, OSROK, increased its staff for previous Bank projects. The annual volume of procurement (less than US$25 million) is not expected to exceed previous levels by more than 20% and is therefore within the agency's capacity. The CEB and IEB each have about 35 staff members. It has been estimated that the staff of these two agencies could each evaluate about 30 subproject applications a year due to similarity of subprojects, oversee implementation, and monitor progress, all of which would not exceed demands on staff under the program. The MOE has also arranged for outside assistance to complement its permanent staff capability. These arrangements include the formation of a technical assistance group of local and foreign specialists (in part, using funds from Loan 1096-KO) to assist in subproject preparation, and the appointment, during implementation, of ad hoc task forces of up to 20 specialists (from universities and industry) to assist in subproject appraisal. It is expected that modifications would be made in these organization and staffing plans as experience is gained during execution.

Procedures

5.11 The Government has designed and tested procedures appropriate for the implementation of the program. These procedures are as shown in diagram 5.2. The procedures cover generation, implementation, monitoring and evaluation. They have been designed to ensure that subprojects conform with the MOE's overall development plan for higher technical education, adhere to the main project objectives and that implementation is feasible. Procedures for identifying and preparing subprojects were tested during appraisal for two model subloan applications and were found to be satisfactory. In

Diagram 5.2

KOREA
HIGHER TECHNICAL EDUCATION SECTOR PROGRAM
Procedures for Generating and Processing Sub-Loan Applications



ABBREVIATIONS

EFB – EDUCATIONAL FACILITIES BUREAU
CEB – COLLEGE EDUCATION BUREAU
IEB – INDUSTRIAL EDUCATION BUREAU
EPB – ECONOMIC PLANNING BOARD
D.C. – DELIBERATION COMMITTEE

August 13, 1979

addition, the Government brought to negotiations the loan applications and appraisal reports of five subprojects (three national and two institutional programs) for review by the Bank. The appraisals of the subprojects were generally found to be satisfactory.

5.12 Identification. National programs have been formulated by the MOE based on the findings of the three study reports. Subprojects for specific institutions, except for several test cases, have not yet been identified. These subprojects would be decided during the course of implementation based on loan applications submitted by individual universities and colleges. The MOE would advise individual institutions about the requirements for subproject applications, the items eligible for project financing and would solicit applications. Based on a recent survey through the receipt of about fifty loan applications, the MOE has determined that there is sufficient interest among private institutions to borrow from the loan funds.

5.13 Preparation. The MOE would prepare subloan applications for national programs; individual institutions would prepare their own subproject applications. However, some colleges/universities would not have the technical competence to prepare an acceptable application and would be able to seek assistance from the MOE. Assistance would be provided by the relevant MOE bureau using the technical assistance group. A detailed report would be prepared for each subproject in accordance with guidelines for subloan applications and a pro forma provided by MOE. The Government would bear any costs involved in providing preparation assistance.

5.14 Appraisal. The three MOE bureaus would initially screen subloan applications to determine whether agreed criteria have been met. If met, the Government would appoint task forces on an ad hoc basis for appraisal. The membership of each task force, composed of Korean experts, would depend on the expertise required, which in turn would depend on the content of the subloan application. The task force would review the application, make a field visit if necessary, and submit an appraisal report on a standard format to the Deliberation Committee Chairman (Assistant Minister) through the EFB.

5.15 Approval. The Deliberation Committee would review and approve (or request modifications of) subprojects based on the appraisal report of the task force. Any subproject application exceeding US$2.5 million equivalent of Bank financing would be submitted to the Bank for prior approval./1 This amount would be adjusted during implementation to achieve prior Bank review of about 20% of all subprojects. The Bank would make a random ex post review of smaller subprojects during supervision visits. After Bank approval has been obtained for the larger subprojects, the Deliberation Committee would submit the application to the Vice Minister of Education. If outside agencies were

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/1 The amount of Bank loan per subproject would average US$1.5 million equivalent.

involved, or the subproject raised substantive issues, the application would be forwarded to the interministerial Planning and Management Committee of the EPB for its recommendations. Based on these recommendations the Vice Minister would forward the subproject application to the Minister of Education for final approval. During negotiations the Government agreed that all subproject applications exceeding US$2.5 million of Bank financing would be sent to the Bank for review prior to being submitted to the Vice Minister.

5.16 Supervision. The Vice Minister, assisted by the Executive Director, would oversee the implementation of national programs and the subprojects. The Executive Director, in turn, would depend on the three subcomponent managers for supervision of the educational aspects of the program and on the staff of EFB for supervision of procurement. The Executive Director would be responsible for following up on the execution of subprojects at particular colleges/universities. The role of the Bank would be to hold discussions on policies affecting the subsector, check overall progress on institutional reforms, and make random checks on approved subloan applications to ensure that they conform with agreed criteria. It is not expected that the Bank would become involved in the details of assistance to particular subprojects.

5.17 Project Monitoring and Evaluation. The three subcomponent managers (para. 5.09) would be given the responsibility of continuously monitoring the progress of each subcomponent. These persons would be responsible for collecting up-to-date information on the status of their respective components and preparing quarterly evaluation reports for the Executive Director (Diagram 5.1)./1 Particular attention would be paid to the recruitment of new teaching staff. The Executive Director would submit quarterly progress reports to the Vice Minister and to the Bank. In addition, a panel of experts for each subcomponent, under the aegis of the respective accreditation agency, would report annually to the Vice Minister and the Bank on achievement of goals and would make recommendations for improvements and modifications in the proposed loan. These reports would form the basis for comprehensive annual loan and policy reviews with the Bank. During negotiations the Government and Bank reached agreement on monitoring and reporting requirements, including timing of annual comprehensive reviews with the Bank on performance.

Criteria for Allocation of Loan Funds

5.18 General guidelines and criteria have been established to promote the achievement of program goals. Three sets of criteria (Annex 1) would be followed in implementing the proposed loan, viz. criteria by which institutions would be eligible to apply for loan funds; general guidelines on the

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/1 An early task during project implementation would be the development of an effective information system on project accomplishments and the establishment of specific targets against which to measure progress. Some targets are implicit in the proposed covenants and implementation schedule.

allocation of loan funds by the MOE; and criteria for the approval of subprojects by the MOE. These criteria serve to ensure that loan funds would be directed towards the achievement of program objectives and establish the parameters within which the Government may make decisions in allocating loan funds. The criteria may be amended by mutual agreement in light of experience in approving subprojects during the first year of implementation. During negotiations the Government agreed that it would allocate loan funds in accordance with criteria and guidelines agreed with the Bank.

5.19 Eligibility. Only existing institutions of minimum size possessing five-year development plans would be eligible to apply for loan funds. First, the program would seek to strengthen and consolidate institutions giving higher technical training. Because Korea has a large number of well-established institutions offering higher technical education support would be directed at quality improvement at these existing institutions rather than creation of new institutions. However, new courses or departments, for instance, in the priority fields of industrial engineering and fuel technology, would be eligible for assistance. Second, the use of loan funds would also seek to reduce the fragmentation of departments within an institution. Therefore, the eligibility of an institution would depend on its meeting also minimum college, class and faculty size requirements./1 Third, an attempt would also be made to assure that loan funds would be allocated to institutions that are committed to quality improvements. This would be done through the requirement that each institution prepare a five-year development plan to be eligible for assistance. This plan would contain both an analysis of strengths and weaknesses at the institution and targets for quality improvement, such as staff:student ratios, by which progress could be measured. The Government would extend technical assistance to help institutions in preparation of these development plans.

5.20 General Guidelines for the Allocation of Loan Funds. The MOE would approve subprojects based on a set of guidelines formulated to assure a balanced investment program. These guidelines would help ensure sufficient concentration for individual subprojects to have an impact on quality improvement and, to the extent that suitable applications permit, a reasonable geographic spread of project benefits throughout the country. Priority would be given to expansion of graduate programs and to staff development. The guidelines cover the following areas:

(a) allocation for postgraduate education (at least 20-50% of total loan funds would apply to postgraduate programs, depending on the field);

/1 For engineering departments, at least 5 faculty and an entry quota of 40 students; for management schools, at least 5 faculty, 20 graduate students at a student:staff ratio of 120 or less; and for technician training, colleges should have at least 20 teachers and 500 students by 1980.

(b) participation by private institutions (at least one third of the subprojects or one third of the loan funds by field would be for private institutions);

(c) size of subprojects (a minimum of US$500,000 for administrative convenience up to a maximum of 10% of available loan funds for the field of study to any one subproject);

(d) number of subprojects (no more than three-fourths of existing undergraduate engineering and technician institutions and no more than ten graduate institutions so as not to spread loan funds too thinly); and

(e) regional distribution (at least half the subprojects would be outside the Seoul area).

There would be exceptions to these guidelines and they would need to be interpreted flexibly so as not to limit unduly the approval of high quality subproject applications. It is expected that the guidelines would need to be modified in the light of experience by mutual agreement during the course of implementation.

5.21 Approval of Subprojects. The MOE would evaluate and approve subproject applications on the basis of three criteria, viz:

(a) relevance to sector program objectives;

(b) feasibility of proposed subprojects; and

(c) efficiency of the proposed subprojects.

The first criterion, relevance, means the degree to which the proposal would meet the overall objectives of quality improvement as defined in Annex 1. This consideration would include the analysis of the institution's need for assistance and whether the overall quality improvement plan for the institution has clear targets and programs consistent with program objectives. The second criterion, feasibility, pertains to the degree to which the proposal could be achieved. This consideration would include such topics as the incentives being given to recruit staff (i.e., evidence that the proposed staff development plan could be implemented as planned), the availability of sufficient budget resources to operate the institutions at higher quality levels; the adequacy of proposals for accommodating and maintaining equipment, ability of the institution to manage the subproject and, for private institutions, the ability to repay the loan. Commitment of the borrower to the subproject would also be an important factor in assessing the feasibility of proposals. Third, proposals would be evaluated according to the extent to which loan funds would be used efficiently. This criterion would include such aspects as the common use of facilities and equipment (i.e., utilization rates). Annex 1 provides a further explanation of the criteria guiding allocation of loan funds.

Implementation Schedule

5.22 The MOE has prepared a detailed and reasonable schedule for implementation of the proposed program. The number of subprojects to be approved under the program can only be tentative at this stage, but it is estimated that the program would encompass about 10 national and about 55 institutional subprojects. A tentative schedule has been drawn up that allows implementation procedures to benefit from experience in processing the first few subprojects. Five subprojects have been prepared, appraised and approved after Bank review so that their implementation may begin in early 1980. During this review agreements were reached on modifications to the preparation requirements and appraisal criteria. An additional 50 subproject applications have been submitted by institutions to the MOE. These will be revised in early 1980 to conform with revised guidelines. Because of the similarity among groups of applications, the MOE expects to be able to appraise most of these applications by the end of 1980. Implementation of the approved subprojects would begin in 1981 with completion of Bank-assisted subprojects by the end of 1983. The Closing Date for the proposed loan would be June 30, 1984.

6. COSTS AND FINANCING

6.01 Costs are defined as the total investment program for higher technical education for 1979-83, of which the proposed loan would finance a part. The volume of the investment program for higher technical education program is sufficient to effect important structural changes and improvements in the system of higher technical education. The investment program is economical and would be financially feasible.

6.02 Investment Program. The investment program 1979-83/1 for public and private higher technical education is costed at $515 million net of contingencies and $700 million with contingencies (Tables 6.1 and 6.2). The investment program is based on the costs necessary to achieve (a) projected enrollment expansion; and (b) improvement in the quality of existing facilities. The public sector investment program, $315 million net of contingencies, includes $115 million for national programs (para. 5.02) and $200 million for subprojects/2 (buildings and equipment) at public colleges and universities. The private investment program for private institutions is estimated at $200 million and would cover only about 40% of the projected needs for expansion and quality improvement. This proportion cannot be greater because of constraints on the capacity of private institutions to mobilize the necessary investment funds (para. 3.15). The allocation of investment between components shows that engineering education and technician training would receive $250 million and $190 million, respectively; management education, where equipment needs are less, would receive $75 million (Table 6.1).

6.03 Base cost refers to 1979 prices. Civil works costs are estimated on the basis of Korea Economic Planning Board's standards for building unit costs. Equipment costs are based on the MOE standard equipment list of 1978 and are reasonable. Instructional equipment and professional services (specialists and fellowships) are exempt from taxes. The technical assistance component would include 600 man-months of specialist services and 8,800 man-months of fellowships with estimated costs at US$3.2 million and US$10.9 million, respectively. The average man-month costs of specialist

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/1 The Government has formulated an eight-year (1979-86) investment plan for the higher technical education subsector. This plan, with an investment estimated at US$1 billion equivalent (constant 1979 prices), covers two plan periods, including part (1979-81) of the Fourth Plan and the whole of the Fifth Plan. Bank support is being proposed for the first five years of this plan; for comparability, this first phase (1979-83) has been costed separately and is referred to as the Government's program.

/2 The cost estimates for subprojects are tentative and would depend on the number and type approved during implementation.

Table 6.1: INVESTMENT PROGRAM FOR HIGHER TECHNICAL EDUCATION, BY COMPONENT (1979-83)

Program component	Local	Foreign	Total	Local	Foreign	Total
	---- (Won billion) ----			---- (US$ million) ----		
Engineering education	50	70	120	110	140	250
Management education	25	15	40	50	25	75
Technician training	45	45	90	90	100	190
Total Base Cost /a	120	130	250	250	265	515
Contingencies	40	50	90	85	100	185
Total	160	180	340	335	365	700

Table 6.2: INVESTMENT PROGRAM BY PUBLIC AND PRIVATE SECTOR (US$ million)

	Public				
	National programs /a	Subprojects	Subtotal	Private subprojects	Total
Engineering	85	85	170	80	250
Management	15	45	60	15	75
Technician	15	70	85	105	190
Base cost	115	200	315	200	515
Contingencies	40	70	110	70	185
Total	155	270	425	270	700

/a Includes staff development for all institutions, public and private.

services, including salary, fees, international travel and subsistence is expected to average about US$5,400 per man-month. The man-month cost of fellowships is expected to average about US$1,300. About 10 policy studies would be included and the cost of each is estimated to average about US$75,000.

6.04 The contingencies estimated at $185 million bring the total investment program to $700 million (Table 6.1). Physical contingencies are estimated at 10% and price contingencies at 24% of the base cost on the basis of expected inflation of 8-9% p.a. in local costs and 6% in foreign costs of equipment. Foreign exchange costs are estimated at 25% for civil works, 90% for instructional equipment, 50% for systems building, recruitment and training of new staff and curriculum development, and 90% for technical assistance. The foreign exchange cost of the total investment program is US$365 million or 53% of total cost.

6.05 The economical nature of the investment program is reflected in low unit costs which, in turn, are explained by high utilization rates. The unit costs of capital investment per student place are estimated at US$3,400 for engineering education, US$1,200 for management education and US$4,300 for technician training. These costs compare favorably with unit costs in the region. Planned utilization ratios both for civil works and equipment are also high at about 70-80% of the total available periods per week./1

6.06 Recurrent Cost Implications. The additional recurrent expenditures generated by the public investment program are within the financial capacity of the Government. Enrollment expansion during the investment period, in combination with higher standards (reflecting lower student/teacher ratios, increased practical work and improved staff compensation) would lead to higher recurrent expenditures. For the public sector, these additional expenditures would represent an increase of only about 1% of the MOE's budget (Table 6.3). Recurrent costs would also increase for private institutions as a result of improved education standards. For private institutions, incremental recurrent expenditures would average about $40 million, or about 13% of their 1978 annual expenditure as shown in Table 6.3. Fee increases, justified by the expected high rates of return to students pursuing higher technical education, would largely meet the higher recurrent costs of private institutions./2 The introduction of student loans would help students pay for the tuition costs and reduce any inequities in access which otherwise would have occurred.

/1 Furthermore, facilities would be used by evening class students, about 16% of total enrollment in 1979.

/2 A study would be undertaken by the Government under the program to assess the feasibility of increasing student fees and introducing student loan funds at least in higher technical education as a means to avoid causing undue hardship to students.

Table 6.3: ESTIMATED ADDITIONAL PRIVATE AND MOE RECURRENT EXPENDITURES, 1979-83
(constant 1979 prices)

	1979/80	1980/81	1981/82	1982/83	1983/84
	(US$ million)				
Public	15	30	40	45	45
MOE budget	2,310	2,660	3,060	3,520	4,040
Public expenditure as a percentage of MOE budget	0.7%	1.1%	1.3%	1.3%	1.1%
Private	20	30	45	50	55

6.07 Financing and Bank Contribution. Table 6.4 outlines the proposed financing plan for the investment program.

Table 6.4: OVERALL FINANCING PLAN (1978-83)

Type of Program	Sources of finance				% IBRD Financing
	Government	Private	Proposed IBRD Loan	Total	
	$ million				
Public (Total)	(370)	(-)	(60)	(430)	(14%)
National	140	-	20	160	13%
Subprojects	230	-	40	270	15%
Private-Subprojects	-	230	40	270	15%
Total	370	230	100	700	14%
% Total	53%	33%	14%	100%	

The Government would undertake 53% of the total investment program, private sources would be expected to finance 33% and the proposed Bank loan of $100 million equivalent would cover 14% of the total investment program. The loan would represent 27% of the estimated foreign exchange component.

6.08 The Government's investment program is feasible and within the financial capacity of the MOE. The peak yearly capital investment of MOE would be roughly US$100 million in 1981. This represents less than 4% of the estimated annual budget for MOE in 1981 or about 20% of the capital expenditure, which are reasonable proportions in view of the urgency for improvements in higher technical education. Capital expenditures in private institutions would be financed mainly from their own funds, present endowments, contributions from industry and, if needed, loans from commercial banks. In the 1979-83 period, these sources are expected to generate about $230 million in current prices, or 85% of the total investment in private institutions. Since the Government has provided assurances to the Bank during negotiations that private institutions will be financially assisted whenever necessary, this is considered a reasonable burden (para. 3.15). The remainder would be met from the Bank loan.

6.09 The proposed Bank loan of $100 million would include approximately $60 million for engineering, $4 million for management and $36 million for technical training. These amounts were determined by the government in accordance with overall priorities and relative need for foreign exchange by component. Table 6.5 makes a tentative estimation of Bank financing by component and category.

Table 6.5: TENTATIVE BANK FINANCING BY COMPONENT AND CATEGORY

	Engineering education/a	Management education	Technician training	Total (rounded)
	(US$ million)			
National Programs				
Specialists services	0.9	0.4	1.9	3.2
Fellowships	5.9	2.4	2.6	10.9
Studies	0.4	0.1	0.2	0.7
Subtotal	7.2	2.9	4.7	15.0
Subprojects				
Equipment, books journals, etc.	37.5	0.1	22.1	60.0
Base Cost Subtotal				
Contingencies	15.3	1.0	9.2	25.0
Total (rounded)	60.0	4.0	36.0	100.0

/a Includes US$0.2 million for the establishment of the manpower monitoring system (US$0.13 million for specialists services and US$0.07 million for studies).

6.10 Financing of Private Subprojects. Assistance for software (curricula and staff development) would be financed by the government for private institutions on a grant basis. Assistance for private subprojects (construction and equipment) would be done through loans by the government to the private institutions. The terms (i.e. interest rate, grace period and repayment period) for this onlending would be the same as those the government receives from the Bank except that the government would also bear the risk of fluctuating foreign exchange rates. Private institutions have indicated substantial interest in applying for loans on these conditions since they are more favorable than local commercial borrowing.

6.11 As a means to channel additional public funds into private education (para. 3.16), the government agreed during negotiations that it would: (a) undertake a study before June 30, 1980 to determine the financial requirements of private institutions providing technical education; (b) submit its main conclusions and recommendations to the Bank; (c) discuss and agree with the Bank on the practical measures needed to be taken to effect the required improvements of the system of private higher technical education with a view to beginning by January 1, 1981, the implementation of a three-year program aimed at providing private institutions with required resources; (d) until such time as such three-year program is implemented, set aside funds annually to subsidize the borrowing of eligible private institutions from commercial banks for quality improvement (representing the difference between the prevailing interest rate as charged by the commercial banks and the interest rate applicable to the proposed Bank loan); (e) ensure that these loans would have maturities of 10 to 12 years; and (f) allow private institutions to borrow from the National Investment Fund which provides concessional financing for specified developmental activities.

6.12 Procurement. Under the proposed loan, project teaching equipment would be procured costing about US$80 million. This equipment would be distributed among approximately 55 institutions throughout the country. More than half of these institutions would be private. The equipment items procured would be selected from the standard equipment lists of the MOE which are acceptable to the Bank. The quantity and type of equipment would vary by institution according to its existing inventory, enrollments and development plans. The timing of procurement would also vary according to when the subprojects were approved. An analysis of equipment contracts under Cr. 394/Ln. 906-KO and Ln. 1096-KO shows that the average size of each contract was about US$30,000. Using this norm, it is expected that between 2,500 and 3,000 equipment contracts would make up the estimated US$80 million in the equipment category under the proposed loan.

6.13 The Government and private institutions have well-developed procedures for equipment procurement. The most efficient way to organize equipment procurement under the proposed loan would be to allow the institutions to follow their normal procedures to the maximum extent practicable. First, private institutions normally procure their own equipment off-the-shelf after shopping for the best price. Under the proposed loan, private institutions would be permitted to procure their own equipment according to their procedures which are similar to the Government's local procurement procedures. Alternatively, at their option, private institutions could use the Government procurement agency, OSROK. Second, procurement for public institutions would

be done by OSROK. Equipment items would be grouped for bulk procurement to the extent this is possible, given the different times of subproject approvals. Bid invitations for equipment of public institutions exceeding US$500,000 would be subject to international competitive bidding (ICB) in accordance with Bank Guidelines. The standard preference in bid evaluation would be accorded to locally manufactured goods under ICB. Bid invitations below US$500,000 would be procured on the basis of standard government procedures acceptable to the Bank. These procedures require local competitive bidding for contracts above W5 million, allow the participation of international suppliers, and make awards to the lowest evaluated bidder after deliberation by a joint technical/OSROK committee. These procedures have proved effective in past education projects in procuring equipment at competitive prices and with reasonable speed. Under the above procedures, it is expected that about 75% of the total equipment value would be procured through ICB (including 60% of the $40 million of equipment for private institutions and 90% of the $40 million in equipment for public institutions). Awards would not be referred to the Bank for prior review. OSROK would retain bid evaluations and contracts for random ex post review by Bank staff during supervision. It is expected that Bank field review of equipment awards would cover about 5% of the number (i.e. about 150 larger contracts, or all contracts above $100,000:) and about 40% of the total value of all contracts.

6.14 Disbursements. Disbursements under the proposed loan would be made for:

(a) 100% of foreign exchange cost of imported equipment; 100% of the ex-factory cost of locally manufactured equipment; and 65% of the cost of imported equipment purchased locally; and

(b) 100% of the cost of specialists services, overseas fellowships and studies.

In view of the large number of local contracts (under US$200,000 equivalent) anticipated under the project, the Bank is reviewing an arrangement whereby it would appoint a local bank of good standing, with a wide local network of branches or correspondents, and which is authorized to deal in foreign exchange, as the Bank's agent for processing withdrawal applications against such project expenditures as the Bank may from time to time designate. The agent would periodically send to the Bank the withdrawal applications it has processed, for approval and disbursement by the Bank. The supporting documents together with the duplicate withdrawal applications would be retained by the agent for inspection by the Bank. The agent's external auditors will be required to periodically audit the agent's processing of the withdrawal applications. The agent would not be permitted to engage in prefinancing activities inconsistent with its agency functions. If no local bank is willing to accept such conditions of appointment, withdrawal applications would be submitted without use of the agent, under statements of expenditure. Withdrawal applications for expenditures not designated for processing by the application-processing agent, and in any case all applications relative to contracts subject to prior review by the Bank, will be submitted to the Bank for processing.

6.15 The estimated disbursement schedules by project component, year and semester are given in Tables 6.6 and 6.7.

6.16 Auditing. Separate accounts would be established under the loan to record the expenditure of proceeds. These accounts would be audited by the Ministry of Education, in accordance with standard government procedures under the auspices of the Ministry of Audit. The Executive Director would promptly furnish the Bank with the Ministry of Audit's Annual Audit report of the loan accounts.

Table 6.6: ESTIMATED DISBURSEMENT SCHEDULE BY COMPONENT AND YEAR

Project component	FY80	FY81	FY82	FY83	FY84	Total
	(US$ million)					
Engineering education	0	10	19	17	14	60
Management education	0	1	2	1	0	4
Technicians education	0	5	16	11	4	36
Total	0	16	37	29	18	100

Table 6.7: ESTIMATED DISBURSEMENT SCHEDULE BY SEMESTER

Bank FY & semester	Disbursements	Accumulated disbursements	Undisbursed balance
		(US$ million)	
1980			
2	0	0	100
1981			
1	1	1	99
2	15	16	84
1982			
1	18	34	64
2	19	53	47
1983			
1	17	70	30
2	12	82	18
1984			
1	10	92	8
2	8	100	0

7. BENEFITS AND RISKS

7.01 The proposed sector program would help eliminate major constraints on development of higher technical education by increasing the supply of teachers, equipment and finance. First, establishment of a manpower monitoring system and improvements in the management of enrollments would permit a better synchronization between the supply of, and demand for, higher technical skills, thereby avoiding problems of scarcity which currently impede industrial development. Second, the proposed program would make a major impact on improving the skills and qualifications of graduates through assistance for staff development, curricula development, equipment and accreditation. The skills of graduates such as in design and quality control, would be improved to approximate more closely those required by the increasingly complex industries. Third, although the proposed Bank financing is small in relation to the size of the investment program, it is justified by the contribution it would make to strengthen institutions and procedures. The approach to be followed under the project would enhance the institutional capacity of the MOE to appraise and supervise subprojects, and the organization, procedures and criteria adopted could be used to implement other improvement programs in the education sector. The program would also assist the Government in addressing systematically the resource implications of its expansion plans.

7.02 The basic justification of the proposed sector program is that it would benefit industry. Sustained economic growth in Korea depends upon moving from dependence on labor-intensive industries to skill-intensive export-oriented technologies. The proposed program would help support this process by stabilizing the unit costs of high technology production. In some modern technology-intensive industries, engineers and technicians may represent as much as 25-30% of total employees compared with around 5% of total employees in traditional light industry. Hence, wages for technical manpower represent a significant proportion of total cost of production in such industries. A raised supply of qualified technical manpower, therefore, plays an important role in stabilizing unit costs in such industries. Second, the program would help reduce the costs of in-service training. The improved formal training would reduce the orientation period of graduates from the present two-to-three years to about six months. The better trained graduates would be more immediately productive on the job. Third, the international competitiveness of Korean manufacture requires continued access by Korean industry to advanced foreign technology. Such know-how is expensive, difficult to acquire, and often immpossible to purchase. Korean skilled technical manpower with experience in foreign and advanced firms, who in turn are hired by other firms, represents an important source of technology diffusion in Korea. The greater supply of skilled technical manpower produced under the proposed loan would help ensure a continued cost-effective diffusion of modern technology.

7.03 The proposed loan entails some degree of risk, particularly with regard to staff recruitment and implementation procedures. One risk pertains to the supply of new teaching staff. The lack of incentives may make it difficult to eliminate completely the present acute shortage of teaching staff. Recruitment of teaching staff would be monitored intensively, and the Bank and Borrower have agreed to make concerted efforts in overcoming any shortfalls detected in the expansion program. Brain drain is another risk. The technologists to be trained under the project are in great demand worldwide. The possibility that some may leave Korea for long term employment abroad cannot be excluded. However, in recent years the economic incentives for skilled technical manpower have improved in Korea; increasing numbers of high-level technical manpower have reportedly returned to Korea. The success of the government's industrialization program depends in part on continued adequate incentives for a sufficient number of highly skilled technical manpower to remain in Korea. The proposed program includes, in particular, provisions to repatriate Korean nationals for teaching a third risk is that the proposed sector approach is new for the education sector in Korea, and it is reasonable to expect some initial difficulties in implementation. However, the proposed management framework could be adapted and changed by mutual agreement on the basis of early implementation experience. Moreover, several lessons derived from evaluation of the first education project /1 have been applied in the design of the proposed program, viz: (i) the government participated extensively in project identification and took full responsibility for preparation of the proposed program; and (ii) equipment procurement has been simplified by conforming largely to existing government procedures. On balance, the experience and competence of the Borrower, its familiarity with the content of the proposed program and commitment to the objectives of the program have reduced the risks to acceptable levels.

/1 Credit 151-KO, Project Performance Audit Report, 1801-KO, November 22, 1977.

8. AGREEMENTS REACHED

8.01 During negotiations the government gave assurances on the following matters:

(a) performance of a satisfactory manpower monitoring system (para. 4.06);

(b) a flexible system for allocation of students in higher technical education (para. 4.07);

(c) establishment of an accreditation system acceptable to the Bank (para. 4.10);

(d) incentives for recruitment and retention of teaching staff (para. 4.16);

(e) threshold for prior Bank review of subproject applications (para. 5.15);

(f) criteria and guidelines for allocation of loan funds (para. 5.18); and

(g) measures to increase the financing of private institutions (para. 6.11).

8.02 Subject to the above conditions the proposed project constitutes a suitable basis for a Bank loan to the Government of Korea of US$100 million equivalent, with a term of 17 years, including a grace period of 4 years.

KOREA (EDUCATION V)

HIGHER TECHNICAL EDUCATION LOAN

Objectives. The objective of the sector program is to improve the quality of higher technical education (engineering, technician and management training). Quality improvement is this context is defined as achieving a closer match between what the graduates of higher technical education know and can do, and the knowledgge and skills they require to perform technical tasks for future industrial development. Such quality improvement entails, inter alia, changes in the content of teaching programs to make them better related to the needs of future industrial development; improvements in the number and qualifications of teaching staff; and improvements in teaching facilities, particularly laboratory equipment.

1. Eligibility Criteria

All public and private institutions in engineering, management and industrial technician training would be eligible to apply to the Ministry of Education for loan funds under the program provided that:

1. The institutions already exist in 1979; the loan can accommodate new courses/departments in exceptional cases.

2. The institutions are of the following minimum sizes:

   (a) Engineering Department. At least five faculty members and a 40 student quota for Year 1 students;

   (b) Technician Training. Junior Technical Colleges with at least 20 teachers and 500 students by 1980;

   (c) Management Schools. At least five faculty members, 20 graduate students and a student:staff ratio of 120 or less.

3. The institution has a five-year development plan for quality improvement which includes a systematic analysis of strengths and weaknesses of teaching programs, staffing and facilities at the institution, and identifiable targets in these areas to enable monitoring. Such targets would include proportion of time spent in basic engineering and in laboratory work; staff: student ratios; proportion of staff trained and with industrial experience; and proportion of MOE equipment standard met.

2. General Guidelines for Allocation of Loan Funds

Decisions by the Ministry of Education in approving subprojects would follow these guidelines:/1

/1 It is expected that the guidelines would need to be modified in the light of experience by mutual agreement during the course of implementation.

1. Concentration of Funds. It is expected that no more than three-fourths of existing undergraduate engineering and technician institutions would receive loan funds. No more than ten graduate institutions would receive loan funds.

2. Distribution of Loan Funds by Level. At least 20% of the funds for engineering education and 50% of the funds for management education would be allocated to the development of graduate programs.

3. Participation of Private Institutions. At least one-third of the loan funds (except the management education component) would be allocated to private institutions.

4. Regional Distribution of Loan Funds. No more than half the loan funds (except the management education components) for undergraduate programs would be allocated to institutions in the Seoul area.

5. Maximum and Minimum Allocation per Subproject. No undergraduate institution would be eligible to receive more than 10% of the total amount of respective total loan funds available for engineering and technicians' education. For administrative convenience, each subproject except for management education must be at least US$500,000 in size.

3. Contents of Loan Applications for Subprojects

Subproject applications should contain current, historical, and projected information sufficient to describe the status of the institution's program and the institution's intent for the future, as they are related to the goals for the sector loan and to the goals for the institution. Data would normally be presented, where available, by year for the previous three years and for the future five years. Detailed content for loan applications is expected to include information such as:

A. Objectives and Means

1. What problems the subproject would enable the institution to solve; What the subproject would enable the institution to do better or differently;

2. How the subproject would accomplish these objectives; and

3. What criteria and procedures would be used for measuring results under the subproject, e.g. tracer studies of graduates, achivement tests of graduates.

B. Enrollment Plan

1. Enrollments by year, level, and field of study (Actual 1977-79;/1 Projections 1980-84);

/1 Data, where possible, would be presented by year for the previous three years and projected by year for the next five years.

2. Graduates by year, level, and field of study;

3. Ratios: Internal efficiency rate (i.e. proportion of entering students who complete each year, and the entire program, successfully on schedule), graduation rate by year and field of study.

C. Staff Development Plan

1. Teaching staff by field, level, and qualifiction (Actual, 1977-79; projected 1980-84);

2. Recruitment Plan
- number of teaching staff hired by year, level, and field (Actual 1977-79; projected 1980-84);
- sources of recruitment;
- recruitment incentives to be offered.

3. Training Plan
- Number of staff trained by year and field (Actual 1977-79, projected 1980-84)
- Proposed content and types of training programs (e.g., technical and pedagogical, preservice and inservice)

D. Curriculum Plan

1. Present (1979) and Proposed (1984) allocation of teaching time by field in:
- basic science/engineering;
- laboratory work

2. Proposed new teaching programs, e.g.:
- new fields;
- multidisciplinary
- consolidation of departments
- in-service courses for practitioners

3. Proposed new teaching/learning methods, e.g. independent research, case studies, problem-solving and simulations.

E. Physical Development Plan

1. Inventory of Existing Buildings and Equipment (1979)
2. Deficits in equipment and buildings as compared with MOE standards
3. Targets for physical facilities and equipment.
- List of goods to be procured

4. Proposed utilization ratios per week and per year (including a separate list of any expensive equipment to be used by more than one Department).

F. Financial Plan

1. Expenditures by purpose (e.g. salaries, maintenance, etc.)
2. Level of fees charged by field and the institution's average student fee based on total fees collected divided by enrolled students
3. Income by source, i.e. fees, endowment, industry contributions, government subsidy, etc.
4. Proposed investment program by category (buildings, equipment, etc.)
5. Proposed plan for financing investment program (i.e. loan amount, counterpart financing and sources of counterpart financing)
6. Proposed disbursement schedule
7. Proposed schedule for repayment of principal and interest

G. Management Plan

1. Organization and staffing - who will manage the subproject and how
2. Monitoring, evaluation and reporting
3. Implementation schedule

4. Criteria for Evaluation and Approval of Subprojects

The Ministry of Education will appraise and approve loan applications on the basis of three criteria: relevance, feasibility and efficiency. These criteria should form the basis by which any evaluating or appraising group will arrive at a consensus, although it is recognized that the weight assigned to individual factors may vary to fit the Korean situation. Detailed consideration of criteria is expected to include factors such as:

A. Relevance of Subproject to Quality Improvement Objectives

Subproject applications would be evaluated to determine the degree to which they would meet overall program objectives of quality improvement (as defined in Annex 1, p. 1). Particular care would be taken to ensure that a close fit exists between targets or programs proposed and the causes of quality problems identified by the institution in its five year development plan (e.g. irrelevant training programs, staff or equipment shortages). The analysis of relevance would cover the following topics:

1. Enrollments. Whether projected rates of enrollment expansion are consistent with the overall manpower development plan of the Government and would permit improvements to take place in staff:student ratios and proportion of time spent in laboratory work. For undergraduate institutions preference would be given to those with no, or only moderate, increases in enrollment.

2. Staffing. In view of the priority importance of staff development preference would be given to proposals which include graduate programs for increasing the supply of training of staff, or have strong undergraduate staff development programs. The evaluation would cover both the quantity and quality of staff as follows:

   (a) Quantity. Present student:staff ratios would be compared with targeted ratios by field and a determination would be made of whether the targets are consistent with overall targets. (Table 4.1).

   (b) Quality. Present proportions of trained staff (both formal training and industrial experience) would be compared with targeted proportions and a determination would be made of whether the targets for the institution are within targets for the whole system (Table 4.4).

3. Curricula. Whether the planned changes would meet industry requirements. Proposals would be evaluated for the extent to which changes in teaching programs would: (i) increase the proportion of student time spent in practical laboratory work and in basic science/engineering, (ii) consolidate existing programs (e.g. introduce interdisciplinary programs), (iii)

C. Efficiency of Proposed Subproject

The third general appraisal criterion would assess whether the subproject could be implemented at reasonable cost. This consideration would include the following aspects:

1. Unit Capital Costs. Whether the investment cost per student and per graduate would be reasonable.

2. Utilization Rates. Whether space utilization and equipment use would be sufficiently intensive weekly and annually (e.g. whether expensive equipment items would be shared between departments). Priority would be given to equipment in the order of frequency of use.

3. Staff Work Schedules. Whether staff would have adequate (but not excessive) weekly workloads.

It is expected that MOE will develop acceptable ranges for the above factors, e.g. student/staff ratios, space utilization rates, staff workloads, and unit costs and will specify any targets which may accompany the appraisal and approval. It is expected that MOE will convey the results of its appraisal to the institution and will receive periodic reports from the institution on progress toward goals of the subproject and the achievement of targets set by MOE. Finally, it is expected that MOE will terminate any subproject which is not achieving its targets over a reasonable period of time.

KOREA (EDUCATION V)

HIGHER TECHNICAL EDUCATION LOAN

List of Working Papers and Project Related Documents

1. Comparative Education Indicators, June 1979
2. Educational Pyramid, 1978 (Chart)
3. Higher Education and the Technical Subsector (Working Paper)
4. Summary of Previous World Bank Group Education Projects in Korea
5. Organization of the Ministry of Education, 1979 (Chart)
6. Responsibilities for Generating and Processing Subloan Applications and Implementation (Working Paper)
7. Implementation Schedule (Chart)
8. Draft Terms of Reference for Accreditation Agencies in:
   A. Engineering Education
   B. Management Education
   C. Technical Education
9. Korean Institute for the Development of Engineering (KIDEE) - Objectives and Organization
10. Korea Management Education Board (KMEB) - Objectives and Organization
11. Technican Education Research Institute (TERI) - Objectives and Organization
12. Project Brief dated June 14, 1978
13. Education Subsector Memorandum on Higher Technical Training, IBRD Report No. 1927-KO dated June 26, 1978
14. Terms of Reference to First Stage Appraisal Mission dated October 19, 1978
15. Preliminary Findings and Conclusions of the First Stage Appraisal Mission, November 18, 1978

16. Draft Status Report by Appraisal Mission, January 23, 1978

17. Final Report on the Proposed Fifth Education Project, Ministry of Education, Republic of Korea, February 18, 1979

18. Summary of principal points recorded at the March 19 meeting with Korean delegation by J.C. Calhoun dated March 20, 1979

19. Terms of Reference to Second Stage Appraisal Mission dated March 23, 1979

20. An Improved System for Manpower Policy and Planning in Korea by P. Eklund dated April 24, 1979 (Working Paper)

21. Industrial Strategy and Higher Level Human Resource Development - Condensation of Points, memo by P. Eklund to R.K. Johanson dated March 1, 1979

22. Technology Diffusion to Korean Manufacturing Firms by Source (Table)

23. Back-to-Office Report after second stage appraisal, May 4, 1979

24. Issues paper dated May 15, 1979

25. Decision Memorandum dated June 8, 1979

26. Contributions by J.C. Calhoun, Consultant on Engineering Education

27. Contributions by R.M. Macdonald, Consultant on Management Education

28. (a) Summary of Costs by Purpose of Programs
    (b) Technical Assistance - Specialist Services Required and Studies
    (c) Technical Assistance - Fellowships Required